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New records of *Pseudopaludicola pocoto* Magalhães, Loebmann, Kokubum, Haddad & Garda, 2014 (Amphibia: Anura: Leptodactylidae) in the Caatinga Biome, Brazil

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Abstract: We provide new records of *Pseudopaludicola pocoto* Magalhães, Loebmann, Kokubum, Haddad & Garda, 2014 in the Caatinga Biome in the states of Paraíba and Pernambuco, which fill a distribution gap in this species' range.

Key words: geographic distribution; range extension; Pernambuco state; Paraíba state; South America

The genus *Pseudopaludicola* Miranda-Ribeiro, 1926 is composed by small-bodied species distributed throughout South America (Frost 2016). Among 19 currently recognized species, 17 are found in Brazil (Frost 2016). These small frogs typically live in open areas at lentic water bodies (Magalhães et al. 2014; Andrade et al. 2015).

Species occurring in northeastern Brazil are *P. mystacalis* (Cope, 1887) (Silva et al. 2007), *P. ternetzi* Miranda-Ribeiro, 1937 (Valdujo et al. 2009), *P. parnaiba* Roberto, Cardozo & Ávila, 2013 (Roberto et al. 2013), *P. pocoto* Magalhães, Loebmann, Kokubum, Haddad & Garda, 2014 (Magalhães et al. 2014) and, *P. jaredi* Andrade, Magalhães, Nunes-de-Almeida, Veiga-Menoncello, Santana, Garda, Loebmann, Recco-Pimentel, Giaretta & Toledo, 2016 (Andrade et al. 2016). The species of *Pseudopaludicola* that occur in the northeastern Brazil are morphologically similar from each other but calling structure is clearly different among them (Magalhães et al. 2014).

Pseudopaludicola pocoto is distinguished from its congeners by its smaller size, lack of T-shape terminal phalanges, smooth upper eyelids, presence of abdominal and vocal sac folds, light cream-colored vocal sac, short hind limbs with tibia-tarsal articulation reaching the eye, and advertisement call emitted as a series of three nonconcatenated pulses per note with long intervals (Magalhães et al. 2014). The known distribution of *Pseudopaludicola pocoto* was based on few records for the states of Ceará, Rio Grande do Norte, Paraíba, and Pernambuco (Magalhães et al. 2014; Santana et al. 2015). Recently Andrade et al. (2015) included a new record in the Brazilian Atlantic Forest of Minas Gerais state, the southernmost record of this species. However, this latest record created a 1,050 km gap from the previous known southernmost record in the species' distribution (Figure 1). Herein, we report the discovery of two new populations of *P. pocoto* in northeast of Brazil that help fill this known distribution gap.

Between 2014 and 2015 we searched for anuran specimens by active searches while conducting field expeditions for the herpetological monitoring program of the Integration Project of the São Francisco River (PISF, in Portuguese). Several times we found *P. pocoto* in swamps, calling in shallower areas or near edges of temporary ponds in the midst of vegetation (Figure 2). Males were found calling during day and night from May to July 2014 and from January to April 2015.

A collecting permit was issued by Instituto Brasileiro do Meio Ambiente e Recursos Naturais Renováveis (IBAMA Process #02001.003718/94-54, Authorization #94/2014, 2nd renewal). Voucher specimens are deposited in the Herpetology Collection of Museu de Fauna da Caatinga:

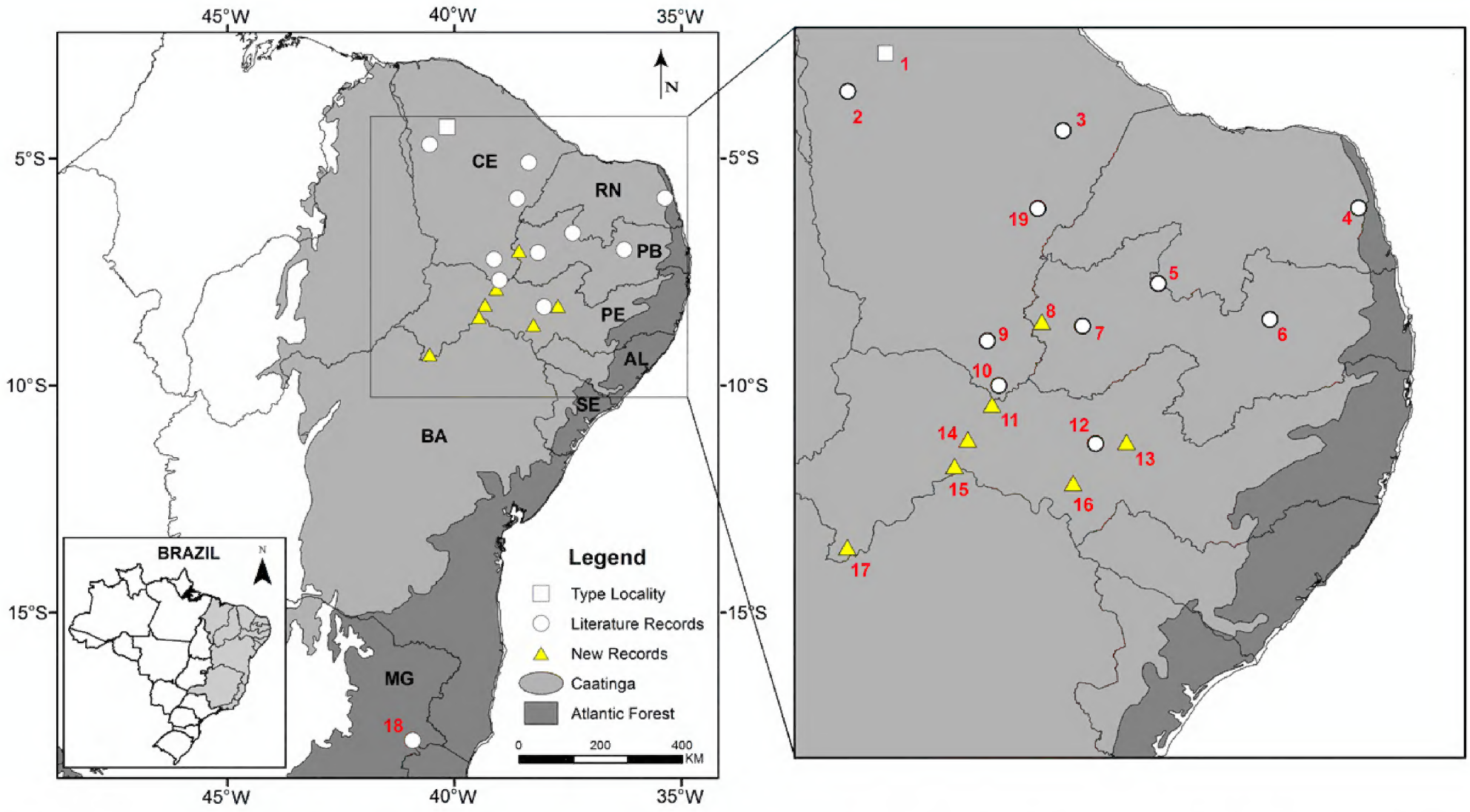

Figure 1. Geographic distribution of *Pseudopaludicola pocoto* in Northeastern region of Brazil (inset). Ceará state (CE): (1) Santa Quitéria, (2) Novas Russas, (3) Morada Nova; (4) Missão Velha, (5) Jati, (6) Jaguaribe; Rio Grande do Norte state (RN): (7) Macaíba; Paraíba state (PB): (8) Serra Negra, (9) Patos, (10) Aguiar, (11) Cajazeiras; Pernambuco state (PE): (12) Betânia, (13) Cabrobó; Minas Gerais state (MG): (14) Sítio Santa Luzia. Other state abbreviations are: Alagoas (AL), Sergipe (SE), Bahia (BA).

Figure 2. Adult male of *Pseudopaludicola pocoto* photographed in Cabrobó municipality, Pernambuco state, northeastern Brazil (Photo: A. S. F. L. S.)

MFCH 3669 (Cajazeiras, Paraíba state, 07°02′09″ S, 038°34′51″ W) and MFCH 3660 (Cabrobó, Pernambuco state, 08°13′54″ S, 039°19′ 53″ W).

We sampled vocalizations of a male of *P. pocoto* (MFCH 3660) in the municipality of Cabrobó on 28 May 2014. We made the recording using a Marantz Portable Recorder PMD660 with a Sennheiser directional microphone ME66 and a sampling frequency of 48 kHz, sample size of 16 bits. Measurements of temporal and spectral parameters of calls were executed in Raven Pro 1.4 software according to the same parameters used by Magalhães et al. (2014): FFT (fast fourier transformation) = 256, overlap = 75, frame = 100. We compared advertisement call parameters to those published by Magalhães et al. (2014) and Andrade et al. (2015) (Table 1). Even though we did not made any recordings of vocalizations from specimens of Cajazeiras, calling males at this locality are very morphologically similar to those recorded in Cabrobó, specially their advertisement call.

All morphological traits and acoustic parameters fitted well on description analyses of *P. pocoto* (Figure 3; Table 1). However, our data on pulse duration were higher than both previous descriptions (Magalhães et al. 2014; Andrade et al. 2015).

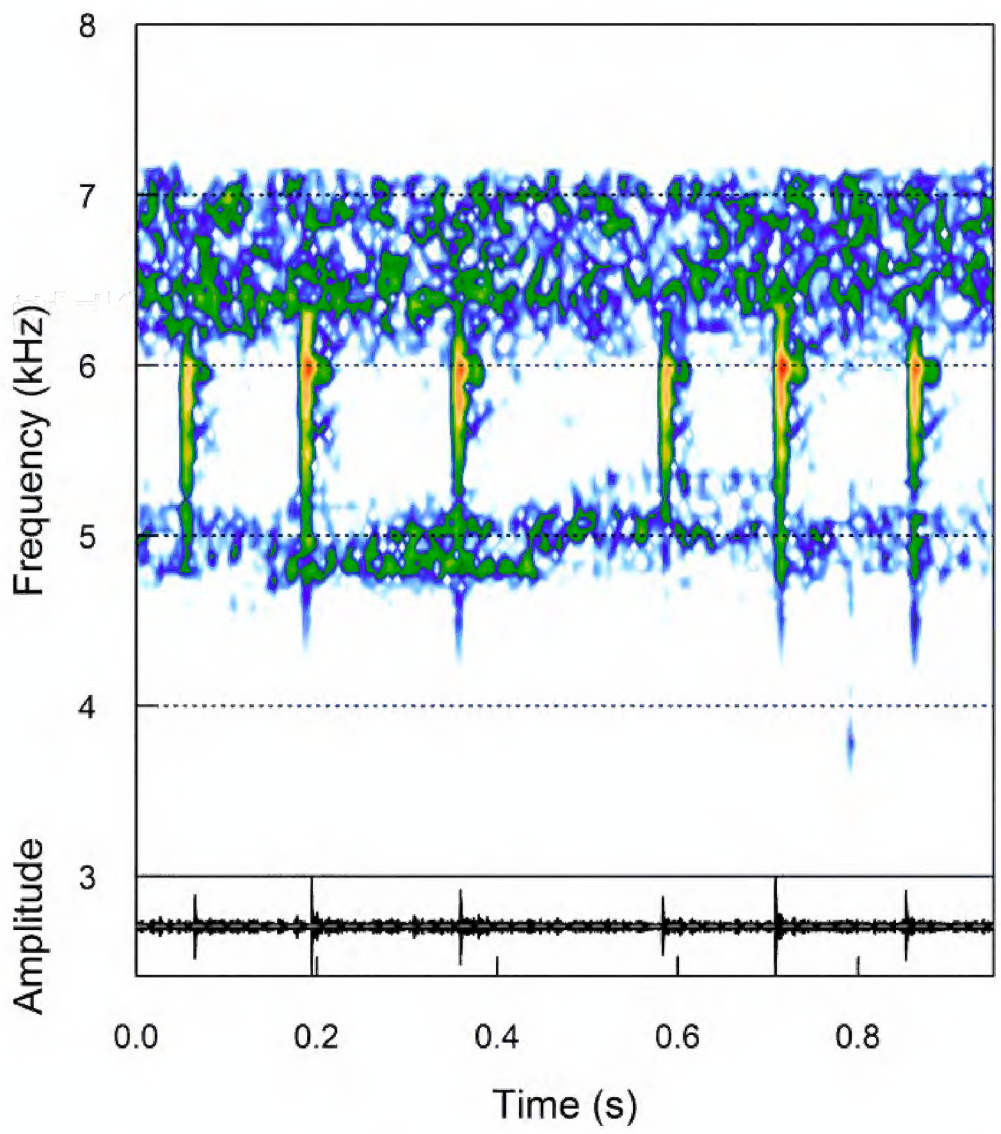

Figure 3. Advertisement call of *Pseudopaludicola pocoto* recorded in Cabrobó, Pernambuco state, Brazil. Spectrogram (top) and oscillogram (bottom) from two notes (6 pulses).

Populations found in the municipalities of Cabrobó and Cajazeiras are the most inland records in the states of Pernambuco and Paraíba, respectively. In fact, we have made five additional records in Pernambuco state by hearing calls of males (no vouchers/calling records collected). Four of these observations are from other municipalities: Salgueiro, Floresta, Custódia and Petrolina; the fifth is from a second locality in Cabrobó.

However, the gap between northeastern and southeastern populations remains large. It is likely that the portion of the Caatinga Biome inside the states of Bahia, Espírito Santo, and Alagoas also has populations of *P. pocoto*. Additionally, it is possible that the distribution of *P. pocoto* could be very large or highly fragmented (Andrade et al. 2015). Increasing the number of studies in northeastern of Brazil, especially within the Caatinga Biome, would help to improve our understanding of the geographical distribution of this species.

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Table 1. Comparison of advertisement call parameters of *Pseudopaludicola pocoto*. Values represent mean ± standard deviation and range in parentheses.

Parameters	Magalhães et al. (2014)	Andrade et al. (2015)	This study
Note duration (ms)	238 ± 31 (126–290)	265 ± 32 (205–323)	274 ± 22 (223–309) (*n* = 30)
Internote interval (ms)	220 ± 59 (136–507)	251 ± 61 (196–447)	203 ± 23 (181–263) (*n* = 18)
Pulse duration (ms)	5 ± 1 (3–8)	6 ± 1 (3–8)	12 ± 2 (7–18) (*n* = 90)
Interpulse interval (ms)	111 ± 21 (43–166)	122 ± 31 (54–205)	138 ± 40 (82–263) (*n* = 78)
Dominant Frequency (Hz)	5636 ± 300 (5168–6374)	5001 ± 90 (4823–5168)	5804±107 (5625–6000) (*n* = 93)

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Author contributions: ASFLS, MAM, MG, and EMJ collected the field data; ASFLS, MAM, and MG wrote introduction and draft methodology; ASFLS analyzed the advertisement call; ASFLS, EMJ, and PAN finished the methodology and wrote discussion; ASFLS, EMJ, and PAN reviewed the final manuscript.

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